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DISEASES DUE TO PROTOZOAN PARASITES.

WARE (F.). **Surra in a Pack of Foxhounds.**—*Jl. Comp. Path. & Therap.* 1928. Sept. Vol. 41. No. 3. pp. 249–254. With 3 charts in text.

An account is given of an epidemic of surra which obliterated a pack of imported foxhounds.

The first animal died suddenly and on the following day another was seen to be ill, but it recovered and was able to hunt two days later. A few days later relapse occurred and the hound died. Within a week of the appearance of disease in the pack ten couples of hounds were taken ill and three died. Anthrax was suspected, but the evidence afforded by the animals' temperatures negatived this. Nevertheless, the whole pack was treated with anti-anthrax serum. Many more hounds fell sick and five couples died within the next few days. Examination of a blood smear of one of these showed that trypanosomes were present.

In the early stages of the disease the only symptom appeared to be fever. The animals retained their appetites and were quite bright. The next symptom was a clouding of the aqueous humour and a sinking in of the eyes with protrusion of the membrana nictitans. Then dullness and loss of appetite were noted, a staggering gait, and acceleration of pulse and respirations. Later nervous symptoms set in—twitching of the limbs, and then coma.

A fairly constant complication of the chronic cases was a severe dermatitis which responded to no ordinary treatment. Animals for the most part recovered consciousness for a variable period before death occurred. In a few instances symptoms resembling those of furious rabies appeared before coma set in.

Novarsenobillon was given intravenously in 0·45 g. doses with 0·3 g. given ten days later, but it appeared to have no effect beyond prolonging the course of the disease.

Some were treated with Bayer 205, but without satisfactory results. Possibly better results might have been obtained if this drug had been given earlier.

An interesting feature of these occasional outbreaks of surra in the dog is the question of the method of infection, and there is some body of opinion in India to support the view that it is by ingestion.

In the epidemic in question the following po nts are noted. The kennels were very free from parasites, and—further—horses stabled near by did not contract the infection. Two and a half couples of hounds which arrived from England on December 7, 1926 were not included in the hunting of the 23 couples involved and did not become infected.

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There is little possibility of Tabanidae being involved as flies are very seldom seen biting dogs of any kind in India and, as already stated, no horses were infected. It is specially noted that there was definite evidence of mortality occurring simultaneously among large animals and jackals in the region where the pack hunts.

Possibly ingestion was the method of infection.

NIESCHULZ (O.). Zoologische Beiträge zum Surraproblem. XVII. Weitere Surraübertragungsversuche mit *Tabanus rubidus* Wied. **[Zoological Contributions to the Surra Problem. XVII. Further Transmission Experiments with *Tabanus rubidus* Wied.]**—*Arch. f. Protistenkunde.* 1928. Mar. Vol. 61. pp. 92–118.

Ninety new experiments involving the use of 3,810 flies have been carried out. Thirteen native horses were used and for these 3,093 flies were employed; the remaining 77 experiments were carried out with guineapigs or mice.

In direct transmission experiments in which the interval ranged from a second to a minute 12 out of 19 experiments were positive. It was sufficient to allow the fly to suck for 5 seconds only either the virus supplier or the animal to be infected. In three out of 9 experiments a positive result was obtained when from two to four animals were used in succession.

Flies were found to be infective at various periods ranging from half an hour up to 6 hours after the infective meal, but from the tables it is gathered that larger numbers of flies were used when the intervals were longer.

After intervals of ten hours or more no positive results could be obtained.

CURSON (H. H.). **Nagana in Zululand.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part I. 1928. Oct. pp. 311–412. With 8 diagrams, 36 figs. on 9 plates, 2 coloured plates & 3 folding maps.

This extensive paper is divided into 7 sections as follows: I, Introduction. Preliminary enquiries, synonyms, definition, and derivation of the word "nagana." II, Distribution. III, Diagnosis. IV, Symptomatology (including experimental transmission). V, Miscellaneous experiments. VI, Chemotherapy. VII, Conclusion.

As is well known, it is Curson's view that the disease known by the Zulus as Nagana is due to *T. brucei*, *T. congolense*, and *T. vivax*.

In connexion with nomenclature the author points out that it is a custom among the natives, as a mark of respect, to avoid the use of the name given to an individual of some rank, especially if the person is dead. In one of the divisions of the country the word "muncu"* came to be used, as a former chief had been called "Nagana." The term "muncu" is used by coastal natives for a condition which on investigation proved to be parasitic gastro-enteritis.

Curson maintains that it is incorrect to limit the word Nagana to the condition caused by *T. brucei*.

No satisfactory explanation has been given regarding the derivation of the word, but in all probability it is related to the Zulu verb "Ku

* Later in his paper Curson spells this word "Umuncu."

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naga " which means " to care " or " be anxious concerning anything." Some nagana animals appear to walk in a most deliberate manner, as if considering how next they should proceed. The actual cause of this apparent caution is sheer weakness.

The noun used by the natives is " unagana " but Europeans more usually pronounce it as " nagaan."

In connexion with diagnosis it is stated that the examination of blood smears as a routine method is sufficient for the needs, but it is, of course, recognized that in many cases examination of smears yields a negative result.

The improvement in treatment has resulted in stock owners becoming more indifferent than ever to the advantages of diagnosis. It is argued, and within limits perhaps rightly so, that smear examination is so often negative in cases of known infection, that the disease is just as readily recognized clinically, and that tartar emetic acts so satisfactorily that blood examinations are a waste of time.

In the future, when the need for closer settlement is realized, when drug treatment is more reliable, and the value of early diagnosis and segregation of the affected is better appreciated, some method of diagnosis more reliable than blood examination will have to be applied.

The author suggests, on the grounds of the results obtained by ROBINSON, that complement fixation may be the method of choice.

The greater part of the material contained in the paper has already been published.

RICHARDSON (U. F.). **Treatment of Cattle infected by** *T. congolense* **with Antimony Potassium Tartrate.**—*Jl. Comp. Path. & Therap.* 1928. Sept. Vol. 41. No. 3. pp. 199–208.

In view of the fact that two outbreaks of infection with *T. congolense* in Uganda have been stamped out by the use of antimony potassium tartrate, and as two years have elapsed since the initial field work was undertaken, the author feels that a review of the work done will be of interest. The article presented is a compilation of the observations of a large number of officers of the Uganda Veterinary Department.

The treatment was begun on a small scale following the publication of CURSON'S results in South Africa, and the satisfactory results obtained appeared to warrant the application of the method on a larger scale.

A request for assistance from a native owner was the opportunity both from the veterinary and from the political points of view.

It was difficult to supply an absolutely satisfactory explanation of the outbreaks which involved herds numbering over 2,000 head, but it is probable that it was due to the introduction of infected breeding cattle from other areas.

All the available evidence went to show that the parasite concerned was *T. congolense*.

In dealing with large outbreaks it has been found essential to employ two veterinary officers for about 6 weeks, and one non-technical officer, particularly in the early stages, to relieve the veterinary officers of the work of organizing labour, food supplies, and the drafting of infected cattle into isolation kraals pending treatment.

In both instances the herds involved were originally in inaccessible country where labour and food were unobtainable and the first step was their removal to the neighbourhood of a motor road to allow of the

easy transport of supplies, etc. This had to be done with great care to avoid infection of other herds, as had the disease spread the blame would have fallen on the veterinary department, and the confirmation of the native suspicion would have defeated both the veterinary and political ends.

Native Veterinary Assistants carried out microscopic examinations under European control, and with five at work it was possible to examine the blood of each animal thrice weekly.

The animals were gradually divided into three groups, (*a*) those under examination, (*b*) those awaiting treatment, (*c*) those under treatment or treated.

The dose of the drug was 15 grs. in 25 cc. of distilled water. Any animal found infected received four doses intravenously on consecutive days. No estimate of body weight was made, and the dose was not varied save in the case of young or weak animals when the initial dose was reduced.

It was noted that if the cord raising the jugular was released while the injection was being given there was a tendency for the needle to slip from the vein with the resulting abscess formation. If the cord were kept tight until the whole of the dose had been injected this did not happen, and abscess formation was reduced to a minimum.

Details are given of the various herds treated, and the summary shows that 2,210 head of cattle were under observation. Seven hundred and eighty-two were treated, and the number of deaths recorded since treatment is 38.

Prior to the beginning of treatment some hundreds had died.

A careful examination of the herds treated in 1925 was made in 1926 and 1927 and except for one or two cases no trypanosomiasis could be found.

The increase in the size of the herds, and the improvement in the quality of the animals was very marked.

The conclusions drawn are as follows :—

"1. That treatment of outbreaks of trypanosomiasis due to *T. congolense* has a marked value in the control of the disease in Uganda, in that it dispenses with the necessity for an indefinitely prolonged quarantine, irksome to all concerned and difficult to enforce.

"2. That treatment in these two outbreaks was successful in preventing further spread of the disease from the infected herds to neighbouring stock.

"3. That treatment lead to the recovery of the great majority of infected animals. While a few infected animals remained, no further spread of disease occurred in the herds concerned.

"4. That, if this method of dealing with an outbreak is to be effective, staff and equipment must be sufficient to ensure the isolation of infected animals before the infection has spread from them to others. The interval of safety between infection and removal varies with local conditions, but, practically, removal of infected animals every 48 hours will rapidly reduce incidence of cases and finally eradicate the disease."

WENYON (C. M.). **The Loss of the Parabasal Body in Trypanosomes.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. June 30. Vol. 22. No. 1. pp. 85–87.

It has long been known that animals infected with trypanosomes and treated with certain drugs may show in blood films a proportion

of parasites which have no parabasal body. (These have been described as ablepharoplastic.) It has since been observed that this may be the case in animals not so treated.

In 1927 KEILIN found in a blood film which was one of a batch sent to him by Wenyon, that the *T. marocanum* (*T. evansi*) present were all devoid of parabasal bodies. Further films from infected guinea-pigs showed that all the trypanosomes were in the same condition. The strain was passed through rats without inducing any change. It is not known when the change occurred, but re-examination of a film made a year previously showed that at that time the parasites were aparabasal, and examination of a still earlier film showed that only a proportion were in that condition. The strain does not appear to have altered in virulence nor has it been used for drug experiments.

Attention is drawn to the fact that the aparabasal *T. marocanum* now closely resembles *T. equinum* of S. America.

LEDENTU (G.). Au sujet des trypanotoxines. [**Trypanotoxins.**]—*Bull. Soc. Path. Exot.* 1928. July 11. Vol. 21. No. 7. pp. 544–551.

The author recounts briefly the attempts which have been made to prove the presence of a trypanotoxin, and concludes that the evidence is not as yet convincing. The phenomena produced by the intravenous and intraperitoneal injections of trypanosome extracts of various kinds appear rather to be in the nature of anaphylactic shocks. In his own experiments the author has employed exclusively the subcutaneous path, but he admits that his results are not superior to those obtained by other investigators.

On clinical grounds there is considerable support for the view that a definite trypanotoxin exists. Laboratory experiments may modify the physiological characters of trypanosomes very profoundly, just as the characters of bacteria may change under artificial conditions. Even transmission by inoculation in guineapigs in series may effect such a change.

In reality it is the symptoms presented by cases of natural infection which give the clues to the physiological character of the causal agent of a disease, and in the case of trypanosomiasis the train of symptoms clearly suggest that the disease is an intoxication.

The toxin produced may indeed be one of small activity like those of streptococci, colon-bacilli, and other bacteria. It is certainly not in any way comparable to those of the true toxigenic organisms such as the tetanus bacillus. But even among the trypanosomiases there is one disease which approximates in its clinical aspects to these latter bacterial diseases. In acute dourine an animal may succumb within a few days showing symptoms of paralysis, when trypanosomes are extremely scanty in the blood, and are localized in the oedematous plaques. Such cases cannot be ascribed to the mechanical effects of trypanosomes.

On the other hand there are forms of trypanosomiasis in which trypanosomes may swarm in the blood, and yet the infections are quite benign. Among these are infections with *T. lewisi* and *T. theileri*.

The very fact that pathogenic and non-pathogenic trypanosomes occur is an indication that the presence of the flagellates is not alone sufficient for the liberation of an anaphylotoxin in the animal body.

Clinical experience suggests that it is very probable that trypano-toxins exist, but as yet they have not been demonstrated satisfactorily.

PANISSET (L.). La dourine. Diagnostic, traitement et prevention. [**The Diagnosis, Treatment and Prevention of Dourine.**]—*Rec. Méd. Vét. Exot.* 1928. Apr.–June. Vol. 1. pp. 65–76.

This paper is a review of existing information regarding dourine.

HEGNER (Robert), SHAW, Jr. (Edwin H.) & MANWELL (Reginald D.). **Methods and Results of Experiments on the Effects of Drugs on Bird Malaria.**—*Amer. Jl. Hyg.* 1928. July. Vol. 8. No. 4. pp. 564–582.

The work here reported upon is a part of the work that is being done in connexion with the search for more efficient treatment of malaria than quinine and other substances give. It appears to be probable that a drug which is effective against avian malaria will be effective against the human type of infection.

Throughout the work it has been assumed that the malarial parasite is within the host cell, and that a therapeutically active substance must penetrate the cell before it can act on the parasite. RATCLIFFE'S work has shown that the parasites are definitely intra-corpuscular. Further the drug must be relatively far more toxic for the parasite than the host.

In the routine work all drugs are first tested on the free-living *Paramoecium caudatum*. It may be that this furnishes a poor index, if indeed any at all, but it is found that quinine and related alkaloids are toxic to Paramoecium in proportion to their effectiveness in malaria.

The absorption of various quinine derivates by human and avian red corpuscles was tested and it was found that only those compounds which do not yield ions at neutral point are absorbed. The loss of penetrating capacity is associated with a loss of toxic action on the parasites.

It seems, therefore, desirable to limit studies on the anti-malarial action of drugs to compounds which are absorbed by red corpuscles or which are changed in the body into a type of substance capable of absorption.

The parasite used in the experiments was *Plasmodium cathemerium* since it has a 24-hour asexual cycle and produces high infections. The minimal lethal dose for canaries of each drug used was determined. The birds were inoculated intramuscularly, intraperitoneally or intravenously with infective blood and the doses of drugs were given usually orally with a Luer syringe. Drugs belonging to six series were tested as to their absorption coefficients, their lethality to Paramoecium and their effects on bird malaria. Eight drugs of the quinine series were effective against the Plasmodium, and of the other series mercurophen seemed to be the most promising.

The work has been of great value in that it is possible to predict from a formula whether a drug will be of value or not.

CARRÉ (H). La coccidiose du mouton. [**Ovine Coccidiosis.**]—*Rec. Méd. Vét.* 1928. Sept. Vol. 104. No. 9. pp. 530–539.

The author finds that ovine coccidiosis is more widely spread, at least in some districts in France, than has generally been thought, and

that rapidly fatal cases in lambs may kill off 25 per cent. of the whole number in the flock.

In animals infected with coccidia the symptoms are extremely variable because the condition ranges from animals which are very lightly infected, and which appear to be in perfect health, to those heavy infestations which kill very rapidly. Further, the condition is not infrequently complicated by parasitic gastro-enteritis. In the very acute cases there is marked constipation, and the faecal pellets are covered with shreds of mucus, sometimes flecked with blood. In rare cases actual clots may be passed.

This form of the disease occurs in lambs of one to two months, and death may occur within a day or two of the first evidence of ill-health being observed. In such cases dyspnoea and acceleration of the heart may be observed a few hours before death.

These symptoms the author believes to be due to a toxic action on the nerve centres.

The lesions of the disease vary greatly in extent. The author quotes DAUVOIS as saying that they occur in the intestine, liver, kidneys, and muscles.

In cases of what Carré calls " latent " coccidiosis, that is to say cases presenting no sign of ill-health, the lesions occur as small white specks in the mucous membrane of the intestine. These lesions are not found in acute or chronic cases in lambs. The mucous membrane in such cases may be so thickened as to almost occlude the lumen of the bowel.

The lesion in the muscles, which Carré says was first pointed out by DAUVOIS, takes the form of a longitudinal streaking, caused by blanching of certain fibres.

Carré attributes the condition known in England as " pulpy kidney " in lambs to the presence of coccidia.

Thymol is described as being the most effective medicinal remedy. It is given dissolved in oil at the rate of 1 gramme per 10 kilos body weight. It is given daily for 5 or 6 days, and then repeated after an interval of a week.

LEVADITI (C.) & URBAIN (A.). Essais de chimiothérapie dans la piroplasmose canine expérimentale. [**Experiments in the Treatment of Canine Piroplasmosis produced Artificially.**]—*Rec. Méd. Vét.* 1928. July. Vol. 104. No. 7. pp. 395–397.

The authors have tried tartro-bismuthate of sodium and potassium, but find that neither drug has any protective or curative property. The toxic dose is in the neighbourhood of 0·1 gramme per kilo.

Stovarsol, on the other hand, is found to possess valuable curative properties. It may be given by intramuscular injection and it prevents the development of the disease, or cuts it short if it is already evident.

THEILER (Arnold) & GRAF (H.). *Gonderia mutans* **or** *Theileria mutans*.—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part 1. 1928. Oct. pp. 71–106 With 19 figs. on 4 plates.

As the title of the paper indicates, the question of the validity of the genus *Gonderia*, which has been questioned by BRUMPT, is critically

examined, and the publication contains details of experiments designed to furnish evidence on the point.

It has been held in South Africa that the essential difference between the genera is that plasma bodies are to be found in the spleen and elsewhere in cases due to Theileria and not in those caused by Gonderia.

All the evidence shows that, in any case *Theileria annulata*—the parasite encountered by BRUMPT and probably also by DOYLE—does not occur in South Africa.

Prior to the publication of BRUMPT'S paper in 1923 plasma bodies were found in spleen smears from a small number of calves in the Marico district of the Western Transvaal. East Coast Fever could be excluded as the mortality in the area involved was limited to young calves.

Further investigations in the same district indicated that the mortality among the calves was due to a mixture of infections, among which was a paratyphoid condition. Further investigations in the same area at a later date again revealed the presence of plasma bodies in two calves. A number of other animals were infected with the paratyphoid type of bacillus.

Experimental investigations were undertaken on the following lines:—

1. The examination of the superficial lymph glands of young calves inoculated with *P. mutans* with subsequent slaughter and examination of the spleen.

2. To allow cows to calve on heavily tick-infested ground so that the calves might be exposed to tick infestation from the beginning. To keep the calves on a somewhat restricted milk diet (to imitate the natural conditions obtaining at Marico) and examine the glands and spleen at frequent intervals immediately *P. mutans* was seen in the blood.

3. Should plasma bodies be found the spleen pulp was to be used for the inoculation of susceptible calves kept free of ticks.

4. To expose susceptible full-grown calves to tick infestation for a short time, to observe them in the stable, and to examine the glands irrespective of the presence of parasites in the blood.

5. To remove the spleen of calves that show a mutans infection in order to cause a relapse and to examine the lymph glands for the presence of plasma bodies as well as the blood.

The idea of using splenectomy in the investigation originated in an observation made by DE KOCK and QUINLAN that relapses to piroplasmoses occur in both horses and cattle as a result of splenectomy. It was thought that this might occur in *P. mutans* infection and that plasma bodies might re-occur.

Details of these experiments are given.

Reference is made to a paper by TURNBULL, who has also encountered plasma bodies in cattle suffering from a disease which cannot be classified as East Coast Fever. This author was unable to carry out any transmission experiments, and therefore it is impossible to make certain of the identity of the parasite.

TURNBULL found plasma bodies with considerable ease, but DU TOIT, who has examined TURNBULL'S films, could not recognize all the bodies considered by TURNBULL to be plasma bodies as such. But there was no doubt regarding the nature of some of them.

Summarizing Theiler and Graf say that (*a*) field observation and experimental investigation have shown that young calves

may be infected with a parasite which has a plasma-body stage; (*b*) in the cases of the animals in which these were found infections with *Theileria parva, T. dispar,* and *T. annulata* could be excluded for epizootic, enzootic, and experimental reasons; (*c*) the interpretation of the presence of plasma bodies is that they belong to the cycle of *P. mutans,* alias *Gonderia mutans,* which parasites were found in the blood at the same time; (*d*) the suggestion of BRUMPT that *Gonderia mutans* should in reality be *Theileria mutans,* finds support in the investigations recorded, and the genus *Gonderia* should therefore lapse.

STECK (Werner). **Histological Studies on East Coast Fever.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part I. 1928. Oct. pp. 243–280. With 12 figs. and 9 graphs on 12 plates.

It was originally intended to study: (1) the lesions occurring in the kidneys, (2) the distribution of the lesions in the various organs, (3) the ultimate fate of the large foci in recovery, and (4) the morphological changes in the blood.

The experimental cases produced in the course of the investigation took such a rapid course in every case that there was little chance of the development of late lesions in various organs. Parts 2 and 3 were therefore dropped out.

The kidney lesions have long been described as infarcts, but this view of their nature has not found universal acceptance, and Steck summarizes the views of these authors. Steck finds that whatever the size of the lesions in the kidneys their structure is the same, and also that in cases where there are prominent lesions, small, microscopic ones exist at the same time.

A careful study of serial sections shows that the lesions begin in the neighbourhood of small arteries in the cortex.

He finds that the whole focus is a rapidly proliferating lymph nodule taking its origin in the adventitia of small arteries.

At the periphery of large lesions the infiltration can be seen following the lymph sheaths of the small arteries.

The original tissue elements show remarkably little change. The interna and media of the arteries are not involved.

Polynuclear forms of *Theileria parva* may be found in a large number of them. In the liver there is a marked interstitial round-celled infiltration in some cases. In the capillary blood the proportion of white corpuscles present is considerably in excess of the normal.

In most cases there occurs in the periportal interstities a more or less dense infiltration with rounded cells. The majority of these contain Koch's bodies.

From examination of the blood before narcosis, during narcosis and after death, from various organs in the latter case, it appears that a leucopenia sets in with fever and that the lymphocytes accumulate in the capillary system.

DU TOIT (P. J.). **On the Nature of Anaplasma.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part 1. 1928. Oct. pp. 157–184. With 6 figs. on 3 plates.

The experiments described in this paper were carried out with a view to test the accuracy of the conclusions arrived at by DIAS and ARAGAO in 1914 regarding anaplasma and anaplasmosis. Their main

conclusions were that anaplasma is not a protozoon and that anaplasmosis is not a separate disease.

The author points out that at this date the second of these conclusions hardly merits discussion.

The first set of experiments were designed to show whether the injection of trypanblue and other chemicals produced the blood picture of true anaplasmosis.

The second series had for their object the comparison of the blood picture produced in small animals by the injection of blood poisons with the blood picture of anaplasmosis.

The object of the third series was to show whether the " virus " of anaplasmosis is contained within the corpuscles, whether it can be destroyed by haemolysis, and whether it will pass through a bacterial filter in haemolysed blood.

In DIAS and ARAGAO'S experiment a calf received a number of injections of trypanblue, the total amount of the drug being 39 g. This experiment was repeated by du Toit with two calves. One developed a typical attack of anaplasmosis and the other did not; the blood of the latter remained normal throughout. The first calf had previously had an infection with anaplasma and had to be regarded as a virus reservoir. The interpretation of the result is that the injection of trypanblue produced a relapse. This view is supported by the fact that *Gonderia mutans* also appeared.

Similar results were obtained with pyrogallic acid. This drug was a more active blood-poison than trypanblue as severe anaemia was produced.

du Toit has not found that large injections of trypanblue produce any anaemia.

Nothing that could be mistaken for anaplasma by people capable of judging appeared in the blood of small animals injected with pyrogallic acid, nitrobenzene, and phenyl hydrazine. Jolly bodies were readily recognized.

It might be held that anaplasma is not the actual cause of the disease but a product of the condition and KNUTH and du Toit advocated this view in 1921. It has, however, been shown in the present experiments that the virus is not filterable, and further, that thoroughly washed infected corpuscles convey the disease on injection.

In view of what is known of the life history of anaplasma it appears to be most reasonable to conclude that it is a protozoan parasite.

THEILER (Arnold) & DU TOIT (P.J.). **The Transmission of Tickborne Diseases by the Intra-jugular Injection of the Emulsified Intermediary Host Itself.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part I. 1928. Oct. pp. 17–44.

1. *Experiments with Heartwater.* An impetus was given to the study of heartwater by the publications of COWDRY, SPENCER and PARKER regarding the occurrence of Rickettsia bodies in Rocky Mountain fever and in heartwater.

One of the transmitting ticks of Rocky Mountain fever is *Dermacentor andersoni*—a three-host tick like *Amblyomma hebraeum*, the transmitting agent of heartwater. Whereas in the case of the human disease the infection can be passed from the adult through the egg or from any of the immature stages to the next, proof has not yet been furnished that the infecting agent of heartwater can pass from

the adult through the egg, although transmission from one immature phase to another is known.

In the case of Rocky Mountain fever it is known that infection is transmitted by inoculation with emulsion of eggs, larvae, or nymphs, the latter soon after moulting, which are the progeny of a tick infected during the adult stage. Emulsions of adult ticks usually fail to cause infection.

The contents of adults infected in any of the mature stages, and which have passed through the winter, or have been kept on ice, are only infective when the ticks have first been incubated or fed, although the adults do readily infect by feeding. The injection of the unfed or unincubated tick may produce a certain amount of immunity. Incubation of unfed nymphs and adults at 37° C. for 24 hours increases the percentage of positive infections.

Parallel experiments have been carried out with heartwater ticks, and the details are set out at length in the paper.

Artificial transmission with *Ambylomma hebraeum* was successful in one instance only when emulsion of unfed nymphs was used, but it was successful in eight instances out of nine when fed nymphs were emulsified. The minimal successful quantity was 0·1 tick per cc. liquid. Normal saline was used for preparing the emulsions. The addition of 50 per cent. glycerin to the saline resulted in destruction of the virus.

2. *East Coast Fever.* The transmitting agent is again a three-host tick, but the transmission of the causal agent—*Theileria parva*—is rather difficult in that the infection is not passed through the egg, and that for any stage of tick development to acquire infection the parasite must have fed in the immediately preceding stage on an infected animal. The nymphs and adults only transmit the disease within an interval of 72 to 120 hours after attachment to the host. This fact was taken into consideration in the experiments. Full details of all the experiments are given.

Batches of nymphs were fed on infected animals and adults from these were used as controls. Other adults were emulsified and used for intravenous inoculations. Six experiments were carried out, but with positive results in one only in which case the ticks were 16 days old. In the other experiments the ticks were not younger than 144 days.

Seven experiments were carried out with nymphs. All the nymphs used were controlled by being fed upon susceptible cattle.

Emulsions of nymphs fed for 72–96 hours proved infective for 5 animals out of 9. The failures were all in one batch fed exactly 72 hours before being removed. Nymphs fed for 96 hours or more proved infective in only two cases out of nine. Unfed and fed incubated nymphs were not infective. In this case the question of the age of the nymphs appeared to be without significance since the batch which failed were 230 days old, and the one which succeeded was 300 days old. Animals which failed to react were proved to be susceptible.

YAKIMOFF (W. L.). Der dritte Erreger der Rinderhämoglobinurie im Nord-Kaukasus (*Françaiella colchica* n. sp.). [**The Third Cause of Bovine Haemoglobinuria in Northern Caucasus** (*Françaiella colchica* **n. sp.**]—*Arch. f. Protistenkunde.* 1928. Vol. 62. pp. 105–118.

The author claims to have discovered an intracorpuscular parasite

which is a cause of red-water in Northern Caucasus From the tables of measurements given it would appear that the new parasite is intermediate in size between *Piroplasma bigeminum* and *Françaiella caucasica.*. Only the question of morphology is dealt with in this paper.

KLARENBEEK (A.). Dierproeven met een genuine Leptospirastam van den Hond. [**Experimental Inoculations with a Leptospira isolated from a Dog.**]—*Tijd. v. Diergeneesk.* 1928. Sept. 15. Vol. 55. No. 18. pp. 925–927.

The author describes a case of leptospiral jaundice in a dog, and succeeded in infecting guineapigs by means of the urine. The parasite was transmitted from guineapig to guineapig and from the guineapig to the dog.

MATHIS (C.). Identité, à Dakar, du Spirochète des rats, du Spirochète de la musaraigne et du Spirochète récurrent humain. [**The Identity of the Spirochaetes of Rats, Shrews, and Human Beings at Dakar.**]—*Bull. Soc. Path. Exot.* 1928. June 13. Vol. 21. No. 6. pp. 472–485. With 2 graphs in text.

The author considers that the spirochaete of the rat, the shrew, and the human being are very closely allied since the infections produced in experimental animals closely resemble each other, and since cross immunity exists. He suggests that they should all be referred to the same species, *S. crocidurae*, Leger.

Rats and shrews act as reservoirs for the virus, and it must be admitted that while spirochaetosis is of frequent occurrence in these animals, it is only occasionally that man becomes infected.

DISEASES DUE TO METAZOAN PARASITES.

SANDGROUND (J. H.). **Some Studies on Susceptibility, Resistance, and Acquired Immunity to Infection with** *Strongyloides stercoralis* **(Nematoda) in Dogs and Cats.**—*Amer. Jl. Hyg.* 1928. July. Vol. 8. No. 4. pp. 507–538.

The author first discusses the question of resistance to infection. He points out that there are three types of resistance—A, natural immunity; B, age resistance; and C, resistance acquired as a result of infestation. Some authors maintain that type C should be subdivided into (i) resistance to super-infection with persistence of primary infection and (ii) resistance to re-infection with complete disappearance of primary infection.

It is only recently that acquired resistance to metazoan parasites has been considered at all extensively and the most outstanding paper in this connexion is that by BLACKLOCK and GORDON on cutaneous myiasis.

The author then gives an account of the biology of the parasite and passes on to a consideration of host-specificity.

Tabular statements show the course, etc., of the infection in a number of dogs infected experimentally with a strain obtained from a human source.

It was found that disappearance of an original infection as tested by faeces culture was associated with a resistance to re-infection. Variations in individual susceptibility were noted.

Although enormous numbers of larvae were frequently used—some hundreds of thousands—in no case were pulmonary symptoms detected although the parasite passes through the lungs in its migrations.

Experiments with cats are somewhat more difficult to carry out than with dogs because of the difficulty of collecting fresh faeces in quantities that could be regarded as the product of a day. But cats will probably be found to be superior to dogs as experimental animals in studying phases of immunity because they provide sharper pictures of the rise and fall in larval output and they develop a solid immunity more rapidly and more uniformly than dogs.

Cats, in the experiments performed, were infected from dogs, a human being, and another cat.

No significant relationship could be established between the age of the animal and the susceptibility to infection, nor was there any marked co-relation between the size of the dose, the rapidity of elimination of infection and the immunity resulting.

The author then considers possible explanations of the mechanism of the immunity. Is it due to a changed condition of the skin ? Is the blood responsible for the destruction of the larvae ? May passive immunity be conferred by injection of blood ? The answer to these questions was, according to the results obtained in the experiments performed, negative. The nature of the mechanism of the immunity is still obscure.

FIELDING (J. W.). **Observations on Eye Worms of Birds.**—*Queensland Agric. Jl.* 1928. July 1. Vol. 30. No. 1. pp. 37–41.

This paper contains a list of birds, wild and domestic, which have been examined.

Two per cent. of the wild birds and 47 per cent. of the domesticated birds were found to be infected.

A separate examination was made of young chicks from 3 to 24 days old. This gave a total parasitized of about 30 per cent.

A list of places where the parasite has been recorded (with names and dates) is also included in the paper.

Since cockroaches play an essential part in the life cycle of the worm these must be borne in mind when prevention is being considered. Cleaning the soil, absence of shade, feeding by the hopper system and the supply of drinking water on the fountain system are general guiding principles.

FAURE. Microfilariose équine en Tunisie. [**Equine Microfilariasis in Tunis.**]—*Rec. Méd. Vét. Exot.* 1928. Apr.–June. Vol. 1. p. 84.

Equine filariasis has already been recorded in Algeria, Southern Oran, and Morocco.

Faure records two cases in Tunis.

POPOFF (N. P.). **Contribution to the Fauna of Horse-Strongylids of U.S.S.R.**—*Ann. Trop. Med. & Parasitol.* 1928. Aug. Vol. 22. No. 2. pp. 265–266.

This paper gives a list of mature parasites found in three horses. A list of the larval forms is to be published later.

RUMBALL (P.). **Parasitic Worms of Poultry.**—*Queensland Agric. Jl.* 1928. Aug. 1. Vol. 30. No. 2. pp. 157–162.

This is a reprint of notes which appeared in the March number of the same journal in 1926.

MONTGOMERIE (R. F.). **Carbon Tetrachloride in Liver Rot of Sheep: the Stage at which the Fluke is assailable by the Drug, and the Bearing thereon of Dosage.**—*Jl. Comp. Path. & Therap.* 1928. Sept. Vol. 41. No. 3. pp. 191–198.

The author has previously reported that he finds 1 cc. of carbon tetrachloride, given in gelatin capsules, efficient for the destruction of mature and almost mature flukes.

The present investigation was planned to provide answers to the questions as to the earliest stage of development at which the drug becomes effective in that dosage and whether increase in the dose would make the drug lethal to the parasite at an earlier stage of its development.

In the present article the only doses dealt with are 1 and 10 cc. Experiments with 3 cc. and 5 cc. have been carried out, and these are being continued on larger scales. Publication regarding these is therefore postponed.

The sheep used in the experiments were artificially infected, and an article dealing with the technique of this procedure is promised.

It has been found that the extent of infection following the administration of a known number of cercarial cysts varies, and that the rate of development of individual flukes is not constant. The bulk of the information is given in tabular form.

Since the infestation rate and the development rate are variable, absolutely clear-cut results were not to be expected, but reliable data were obtained by using a large number of animals.

When the period between infestation and dosage with 1 cc. was 8 weeks or less few if any of the parasites were killed, but if the interval was increased to 10 or 11 weeks nearly all the flukes were destroyed.

The increase in the dose of the drug shortened the period between infestation and effective dosing.

10 cc. killed some of the parasites four weeks after infestation, and nearly all at 5 to 8 weeks.

Sheep infested with parasites too immature to be killed by the doses given began to pass eggs two weeks after 1 cc. had proved to be ineffective, and about four weeks after 10 cc. had failed to kill them.

The sheep of two groups dosed with 10 cc. showed symptoms of poisoning, but otherwise the doses were well tolerated.

The author is of the opinion that, while a dose of 5 cc. appears to destroy the parasite soon after it gains access to the body, it is perhaps safer to adhere to the 1 cc. dose until the toxic action of the drug on ruminants is better understood. In the case of mountain flocks or range sheep it might be advisable to increase the dose with a view to reducing the number necessary and to lengthening the intervals between dosing.

Montgomerie has previously recommended an interval of a month between doses of 1 cc. but he is inclined to think, as a result of his experiments with artificially infected animals, that it might with advantage be reduced to even two weeks.

In the treatment of sub-acute outbreaks, where parasites have been established about 2 months, doses of 5 cc. should be used, and in acute outbreaks, during epidemic seasons, 10 cc. doses should be given as the parasites are too immature to be touched by 1 cc. doses.

CURSON (H. H.). **The Probable Limits of Glossina Sp. in Zululand.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Nov. Vol. 22. No. 3. pp. 281–284.

Curson has collected his information from the files connected with Nagana at the Nagana Research Laboratory in the Lower Umfolosi District, by sending a circular letter to those residents who would be likely to assist—as had previously been done by MONTGOMERY—by interviewing officials and traders in various parts of the country and by actual experiments with tethered animals in various parts of the country. From the information thus gathered Curson has compiled a map. This map shows that the " fly-country " of Zululand is a continuous strip of country extending southwards from Mozambique to the Ngoye Range in Mtunzini District. It had previously been thought that there were several different areas.

The western boundary in Ingwavuma and Ubombo Districts as far south as Nkuzi Poort is the Lebombo Range. There is no evidence to show that fly travel westwards into Swaziland or the Transvaal. In the Nongoma and Hlabisa districts no definite westward boundary can be laid down. The southern boundary is the Ngoye Range, which forms the watershed for streams running north to the Umhlatuze River and south into the Umlalazi River.

The eastern boundary is the least clearly defined, but the Lower Umfolosi Hills form the southernmost portion of this boundary.

BACTERIAL DISEASES.

DUNCAN (J. T.). **The Identification of *Brucella abortus* from Human Sources.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Nov. Vol. 22. No. 3. pp. 269–280.

Cases of undulant fever which cannot be traced to the goat have been reported from many parts of the world, and it is generally alleged that the source of infection is the cow, and occasionally the pig. But epidemiological evidence of a convincing nature has rarely been put forward, nor has the identity of the infecting organism been established beyond all doubt, although it is usually described, and possibly correctly so, as *Brucella abortus*.

In many cases agglutinin-absorption tests have been relied upon for the identification of *Br. abortus* recovered from man. But the results of different workers in this connexion are not in agreement, and it appears to be inadvisable to rely upon this test solely.

Other features which help in the identification of organisms are: morphology, the atmospheric conditions necessary for artificial cultivation, the biochemical reactions, and the pathogenic properties.

Contrary views have been expressed by different authors regarding the morphology of *Br. abortus* and *Br. melitensis*, but it must not be

forgotten that BRUCE described the organism of undulant fever as a micrococcus, while BANG described that of contagious bovine abortion as a bacillus.

Duncan's experience is that when grown on agar or glucose agar the various species of Brucella show no very marked differences, but when they are cultivated upon a relatively rich medium such as peptic-digest blood agar *Br. abortus* may form distinctly bacillary forms which are three or four times as long as they are thick, while *Br. melitensis* and *Br. paramelitensis* usually retain the coccal shape.

The ordinary type of *Br. abortus* of Europe and North America will not grow in primary culture at the carbon dioxide tension of the air, but requires an increased concentration of the gas. This feature distinguishes this organism from other species of Brucella, from the porcine variety of *Br. abortus*, and from the type affecting cattle in Rhodesia, all of which grow freely in air from the start. Duncan states that the bovine variety loses its dependence upon carbon dioxide after thirteen to twenty subcultures on artificial media. In exceptional cases strains have been isolated from cows' milk which grow aerobically from the start.

It has been shown by HUDDLESON, HASLEY & TORREY that *Br. abortus* may be distinguished from the other organisms by the fact that it liberates hydrogen sulphide from media containing organic sulphur, and that the most suitable medium for the purpose is Stafseth's liver agar.

When the flasks are inoculated a strip of filter paper impregnated with lead acetate is introduced and held in place by the plug. The reaction of the medium should be pH 6·6, as the hydrogen sulphide is liberated only from an acid medium. The flasks should not be capped as the carbon dioxide liberated during growth by combining with alkaline bodies maintains the initial acid reaction of the medium and under these circumstances *Br. melitensis* may liberate hydrogen sulphide.

Duncan is able to confirm the value of this reaction. He finds that, when recently isolated strains are employed, in the case of *Br. abortus* the liberation of hydrogen sulphide ceased while the medium was still acid and that normal recent strains of *Br. melitensis* and *Br. paramelitensis* did not tend to form hydrogen sulphide whether the tubes were capped or not.

The author is of opinion that in the present state of knowledge it is inadvisable to accept unsupported evidence of agglutinin absorption tests as the means of identifying *Br. abortus*.

The pathogenicity of organisms for the guineapig may, under carefully controlled conditions, afford valuable information. The relative pathogenicity of *Br. melitensis* and *Br. abortus* as found in Rhodesia is now being investigated in that country.

The author reviews the cases of *Brucella abortus* infections in man reported from North America, Italy, and Rhodesia.

Within recent years undulant fever has been reported as occurring in countries formerly thought to be free. This may in part be due to more care in investigation and more accurate diagnosis. Duncan has come to the conclusion that in some areas, particularly Palestine and Rhodesia, the evidence points to the very recent appearance of a disease the carrier of which seems to be the milch cow and the causal organism *Br. abortus*. This disease is tending to spread.

"Except in northern Italy, where the cattle may be infected with *Br. melitensis*, there is nothing to suggest an extension from the endemic centres of goat-borne disease, but rather the development o a new pathogenic type, differing somewhat from the normal bovine variety of *Br. abortus* of northern countries (of which it may be a variant), but resembling closely the porcine variety."

Emphasis is laid upon the rôle possibly played by the cow in the dissemination of this type of infection.

RINJARD (P.) & HILGER (A.). La maladie de Bang chez les equidés. Localisation pyogènes. [**Bang's Disease in Equines. Production of Suppurative Lesions.**]—*Bull. Acad. Vét. de France.* 1928. July. Vol. 1. pp. 272–279.

While abortion in mares is almost invariably due to *Salmonella abortivo-equinus* there are cases on record which appear to have been caused by *Brucella abortus*. The object of the authors in publishing this paper is, however, to draw attention to *Brucella abortus* as a cause of suppurative lesions in equines.

Normally horse-serum agglutinates *Br. abortus* in strong concentrations only; it is therefore justifiable to consider reactions in dilutions above 1 in 50 as indicating actual infection. Such results coupled with bacteriological investigations furnish convincing evidence that *Br. abortus* is sometimes the cause of suppurative lesions in equines.

One of the authors was practising prior to the war in a stock-raising area where outbreaks of abortion were not encountered. In 1919, on his return, he found that large numbers of outbreaks were occurring, and serological tests showed that in practically every case *Br. abortus* was responsible.

It was also observed that suppurative lesions of the withers and poll occurred with far greater frequency than before, and no traumatism could be found to account for them. These cases occurred, moreover, on farms where abortion existed.

This coincidence having been observed, serum tests were carried out, and positive results were obtained, which indicated that the suppurative lesions were localizations in previously infected animals.

Fifteen cases have been investigated by agglutination tests, and in six of these, where pus was obtainable from unruptured lesions, cultural and inoculation tests have been carried out.

In preliminary tests the agglutinating power of normal serum was first investigated. The sera used were heated at 55–56° for 45 minutes. Forty-one samples were tested. In one case there was complete agglutination in 1 in 30, and in one partial agglutination in 1 in 50. These results have since been controlled by a large number of others and the authors conclude that complete agglutination at 1 in 50 indicates infection.

The fifteen cases examined by the authors have been spread over the years 1923 to 1926, and in 13 of them the agglutination titre has ranged from 1 in 100 to 1 in 1,000. In the remaining two cases the agglutination tests were absolutely negative.

Although the authors were able to find bacteria in smears of pus from unopened lesions, having the characters of Bang's bacillus, they failed in every instance to obtain it in artificial culture. In three instances resort was had to guineapig inoculation. In one of these—a mare which had given a negative result to the agglutination test—

the result was negative. In the other two, in which the agglutination titre was 1 in 300 and 1 in 100 (partial 1 in 300) respectively, *Br. abortus* was isolated from the guineapigs on serum glycerin agar incubated under reduced pressure.

The serum of the guineapigs was tested with emulsions of *Br. abortus* and found to be positive up to 1 in 1,000. The animals were killed three to four months after inoculation and they are described as having spleens four to six times the normal size with the classical nodular lesions.

One strain was used for the inoculation of a healthy bovine, and agglutinins for a bovine strain appeared in the blood.

Emulsions of the strains were tested with sera from infected bovines and agglutination up to 1 in 1,000 resulted.

The authors have not produced poll evil or fistulous withers with the organism, but they have shown that subcutaneous inoculation with culture leads to the production of an abscess containing pus with the same characters as that obtained when naturally developed lesions are opened surgically.

The agglutinating power of the serum goes as high as 1 in 1,000 and this remains steady for several months.

HRUSKA (C.). Le rôle du traumatisme lors de l'infection charbonneuse du chevreau par la voie digestive. [**The Part played by Injury in the Infection of the Kid with Anthrax by the Alimentary Tract.**] —*C. R. Acad. Sci.* 1928. June. Vol. 186. No. 26. pp. 1868–1870.

A number of investigators have found that it is generally impossible to infect animals with anthrax by the introduction of spores into the alimentary tract. BOQUET has shown that when guineapigs which have been starved for 36 hours ingest anthrax spores, these may gain access to the circulation without causing infection and without producing immunity. When the skin is injured however—as has been shown by BESREDKA—the guineapigs die of anthrax with the bacilli in their blood.

Hruska reports the results of repeating these experiments with kids. The kids used were weaned and were fed on goats' milk for 14 days before the experiments were begun. Throughout this period no forage was given in order to minimize the risk of injury.

Three batches of animals were used, and in each case spores and bacilli washed in normal saline solution were used. The first batch were given the suspension by means of a feeding-bottle, in the second lot the material was introduced directly into the stomach by a stomach tube, and the third had the material introduced per rectum by means of a tube.

In each lot half the animals were kept as controls and the other half were cut with a scalpel in the neighbourhood of the jugular and were bled 4 to 8 hours after infection. The blood was defibrinated and part of it was used for making films which were stained with Giemsa while the other part was used for making cultures.

For 12 days after the experiments the animals were given only milk and after this they received hay.

First Series.—Three control kids remained healthy. Of the three traumatized kids one showed spores in its blood four hours after

infection, and haemoculture was positive. Haemorrhagic oedema appeared at the seat of traumatism. The other two failed to become infected and haemoculture was negative.

Second Series.—Four controls resisted infection, as did also the four traumatized.

Third Series.—Four controls remained healthy. Of the four traumatized, one died of anthrax on the 8th day with oedema at the site of injury. In the second haemoculture was negative but microscopic examination was positive, and death from anthrax occurred on the fourth day. In the third haemoculture was negative, microscopic examination positive, and the animal survived. The fourth was negative in every respect.

It thus appears that the digestive canal forms a real barrier to the penetration of anthrax spores and bacilli, but some spores are able to make their way into the blood stream during digestion. Spores and bacilli may circulate for many hours without causing the disease or producing immunity. Anthrax infection only originates at the seat of injury.

VILJOEN (P. R.), CURSON (H. H.) & FOURIE (P. J. J.). **Anthrax in South Africa. With Special Reference to Improved Methods of Protective Inoculation.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part I. 1928. Oct. pp. 431–531. With 7 graphs, 3 maps (2 folding) and 6 figs. on 3 plates.

This extensive paper is divided into 8 sections (excluding those devoted to References and Appendix). These deal with Introduction, Historical, Occurrence in S. Africa, Occurrence in Animals and Methods of Infection, Symptomatology, Diagnosis, Control and Eradication, and Summary and Conclusions.

In his Annual Report for 1921–22 the Secretary for Agriculture stated that the Principal Veterinary Officer reported that the losses from anthrax were greater than the losses from all other contagious diseases. Attention had previously been drawn to the increased prevalence of the disease in the Union by KEHOE in 1919. This paper was actually completed in 1925 and the work carried out was spread over four years prior to that date.

It is not yet known whether the germination of anthrax spores is possible outside the body under natural conditions in S. Africa.

The disease is prevalent on both wet and dry pastures, but in very dry country deaths commonly occur near small watering pans, and the water of such pans has been proved to be infective.

It is well known that the disease occurs more frequently on " grass " country than on Karroo veld where cases are seldom encountered. This may be due either to the fact that on grass grazing is much closer to the ground or that " anthrax organisms cannot live in the particularly arid Karroo."

A lack of facilities for burning or burying carcases is a most important factor in the spread of the disease.

Heat or cold do not appear to influence the occurrence of the disease, and it is suggested that the comparative infrequence of its occurrence in Central Africa is due to its not having been introduced to

any large extent—it would appear that anthrax is a disease of civilization.

Careless stock-owners, European or native, are a menace as no care is taken over the proper disposal of carcases.

There is evidence that Hippobosca flies are concerned in the transmission of anthrax, particularly among horses.

Carrion feeders, animal products, animal transport and lack of veterinary supervision all favour the spread of the disease.

Statistics regarding the species of animals affected are, for various reasons, not available, but it would appear from the statistics of the issues of vaccine that cattle and sheep head the list far and away above the other species; but it must be remembered that the animal population of species other than these is considerably smaller.

Broadly speaking, the susceptibility of the sheep is unvarying, that is to say, individual susceptibility does not play an important part. The goat, on the other hand, possesses a very variable degree of resistance. Vaccines which are absolutely safe for sheep may prove fatal for 30 or 40 per cent. of goats inoculated with it.

The authors carried out experiments with a view to test BESREDKA'S view regarding the susceptibility of the skin, but their results did not lend special support to it.

In connexion with the control of the disease Pasteur vaccine was in use for many years, but it was found to yield rather irregular results; in some cases infection followed and in others there appeared to be no conference of immunity.

In 1920 experiments were begun by KIND for the preparation of a more reliable form of vaccine, and a sporulated vaccine was prepared. This, while it conferred immunity, was dangerous as it sometimes caused serious losses.

The authors give an account at some length of the steps taken to improve the vaccine, and details of the method of attenuation and the appraisement of the degree of attenuation of the cultures used for the spore vaccine. The steps in the preparation of the vaccine itself are also described.

Ten days are required for the establishment of immunity. The duration of immunity is difficult to establish on experimental lines, partly on account of the cost of maintaining a considerable number of animals for long periods, and in these circumstances value attaches to field tests. From this it appears that the immunity lasts for ten to twelve months.

With regard to the best path for the introduction of the vaccine, the authors conclude from their experiments that if there is any preference at all it should be given to the subcutaneous route in preference to inoculation intradermally or by scarification.

The path by which animals contract anthrax under natural conditions is still a matter of doubt. It is generally assumed that it is by ingestion, but it can be shown experimentally that a large amount of virulent material is required to achieve this, and, further, that subcutaneous inoculation does not succeed in every case, and to infect large doses are required. At the time of writing (1925) no complaint regarding the production of anthrax by the vaccine (spore) had been received for a period of over 12 months, during which time over 2 million doses had been issued.

The question whether anthrax can be stamped out completely, even on selected premises, cannot at this time be answered.

SCOTT (I. P.). **The Etiology of Blackleg and Methods of differentiating *Clostridium chauvaei* from Other Anaerobic Organisms found in Cases of Blackleg.**—*Cornell Vet.* 1928. July. Vol. 18. No. 3. pp. 259–271.

The author generally summarizes the position with regard to the present knowledge of the causation of blackleg and concludes that *Clostridium chauvaei* is the primary cause of the condition. *C. septicus* (Vibrion septique) and other anaerobes may be associated with it in the causation of the disease.

The identification of *C. chauvaei* depends upon morphological and cultural characteristics, and on the serum protection test.

As an appendix the author details a scheme for the isolation of *C. chauvaei* :—

" Inoculate four tubes containing 18 cc. of brain medium with the material to be examined. Add 2 cc. of 5 per cent. phenol to two of these. Heat one carbolized and one other tube to 65° for 15 minutes. Incubate at 37° C. Inoculate three 1 per cent. agar dilution tubes from each tube showing growth. Pour into Burri tubes. Incubate. Pick out isolated colonies and repeat until at least four agar transfers have been made. A guineapig should also be inoculated with the material and isolation made from the lesion and from the heart blood.

" Media.—Brain liver medium.—Equal weights of liver and brain are ground up separately and cooked with water. The brains are pressed through a potato ricer. The liver broth is made up to 1,000 cubic centimetres per pound, 2 per cent. peptone, 1 per 1,000 glucose, 1 per cent. ferric sulphate, one per 1,000 calcium carbonate, 0·5 to 1 per cent. sodium phosphate, and 0·5 per cent. potassium phosphate are added. The broth and brains are mixed and poured into large tubes. Sterilization may be made at 15 pounds for three hours, or by heating in streaming steam for one to two hours for 5 days. (If blackening reaction is to be studied omit phosphates and add 1 per 1,000 magnesium sulphate.)

" Iron brain.—Add a short piece of sterile baling wire to each tube of iron-free brain medium.

" Coagulated Albumin.—Loeffler's medium either solidified under vaseline or as a slant. If used as a slant use Wright's tube pyrogallic acid technique.

" Milk.—Fresh milk sterilized under vaseline. A pinch of lime placed in the bottom of each tube before filling improves this medium.

" Gelatine.—One per cent. gelatine containing 2 per 1,000 glucose, 1 per cent. Witte or other peptone containing free iron and calcium or to which 1 per 1,000 ferric sulphate and 1 per 1,000 magnesium sulphate or calcium chloride have been added. Adjust to pH 7·2 under vaseline without filtering.

" Glucose agar.—Meal infusion agar to which 2 per cent. glucose is added. Use after boiling and cooling rapidly.

" Sugar free broth.—Liver decoction, containing 2 per cent. peptone, 0·5 per cent. salt, one per 1,000 ferric sulphate, 1 per 1,000 sodium citrate, 1 per 1,000 magnesium sulphate, reaction pH 7·2, sterilize, cool, inoculate with *C. welchii*, incubate 24 hours, sterilize, filter through cotton. Adjust to pH 7 to 7·2, tube under vaseline 2 parts, paraffin 1 part, or under medium motor oil. Sterilize. Add sterile carbohydrate solution, heat to boiling to liquefy the seal and allow

the carbohydrate to mix with the broth. Brom-cresol-purple may be used as an indicator. Colour changes and gas production give an indication of growth, but must not be used as a criterion of fermentation. This is determined by removing one cubic centimetre of culture from below the seal, placing it in a porcelain dish and adding bromthymol blue."

MAGALHÃES (Octavio). [In Portuguese and French.] Le "Mal triste" des Oiseaux. [**"Mal triste" of Birds.**]—*Mem. Inst. Oswaldo Cruz.* 1927. Vol. 20. No. 2. In Portuguese pp. 323–337. With 7 plates. In French pp. 339–353.

The disease has a widespread distribution in Brazil, and is of seasonal occurrence as an epizootic during the rains. Sporadic cases occur during the winter. The disease generally makes its first appearance in adult birds, but if an outbreak starts with the chicks the disease becomes more serious and fatal.

The acute form runs its course in 24 hours to 3 days, and is characterized by dullness, fever and loss of appetite. There may or may not be diarrhoea.

In less rapidly fatal cases diarrhoea is constant, and the motions may or may not contain blood.

In the chronic form of the disease the average duration is 30 days, but cases may survive for twice this length of time.

Occasionally nervous symptoms such as torticollis are observed, and exceptionally there is suppurative arthritis.

The most constant lesions are found in the liver and spleen. These organs are enlarged and friable, and have a mottled appearance. The comb is cyanotic. There may or may not be congestion of the alimentary tract. Microscopic examination of the liver reveals the presence of areas of necrosis and leucocytic infiltrations. The kidneys show acute, diffuse haemorrhagic nephritis with rupture of small vessels. The intermediate layer shows bacilli attached to the epithelium of the uriniferous tubes. Lesions of a similar general character are to be found in the myocardium, lungs, and central nervous system.

The organism isolated is a non-motile ovoid bacillus. It is gram negative. In cultures broth is rendered turbid. In peptone water turbidity is produced in 24 hours and a characteristic odour is noticeable. Small transparent colonies develop on the surface of agar, and on potato yellowish colonies are formed, the potato becomes blackened, and acid in reaction.

Practically no growth takes place under anaerobic conditions. Gelatin is not liquefied.

The cultures maintain their vitality for many weeks.

The organism is pathogenic for the rabbit, but not for the dog or guineapig.

The serum of healthy birds causes no agglutination, but that of diseased birds may have a titre as high as 1/2560.

Even a month after recovery agglutination may occur in dilutions of 1 in 120.

The organism does not constantly occur in the blood, and inoculations with blood frequently fail to infect.

THEILER (Arnold) & ROBINSON (E. M.). **Botulism (Parabotulism) in Equines.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part I. 1928. Oct. pp. 47–68.

Two types of the disease occur, acute and chronic.

The acute form sometimes runs its course in a few hours; the animals simply lie broadside, become comatose and die without attempting to rise. In others affected animals struggle to rise and appear to be in great pain. Dyspnoea and asphyxia occur.

In cases which survive for 24 hours or so the animals are not able to stand even when they are placed on their feet and in these cases dyspnoea is marked from the onset. Animals appear to remain conscious, as judged by movements of the eyes and ears, for a very variable length of time before coma supervenes.

Sensitiveness of the skin may be normal or hyperacute. The ordinary reflexes persist.

The temperature is in all cases normal, and the pulse, which is at first normal, becomes accelerated. Variations in volume and pressure of the pulse are noted.

In subacute and chronic cases the animals when raised to their feet can stand and even walk, but there appears to be great muscular weakness.

In the chronic cases animals may fall while walking, and in rising they behave in the manner of bovines. Marked muscular weakness may persist for 2 to 5 months.

No symptoms of paralysis of the trigeminus or hypoglossus have been seen, such as have been noted in parabotulism in cattle or in horses produced by parabotulismus bovis toxins.

The condition is not characterized by any specific lesions. Rigor mortis sets in early and the blood clots, although the clotting may be delayed.

Parabotulism in equines is an acute intoxication of the nerve supply of the locomotor apparatus. The sensorium is not affected. Death is actually due to suffocation.

The condition is not of common occurrence, and it is seen usually in stabled animals, which contract it from foodstuffs contaminated by the decomposition of dead animals, *e.g.* rats and other vermin.

There is reason to suspect that in certain localities and at certain times of the year infection of vermin with parabotulinus organisms may be more frequent than ordinarily. Note should be made of unusual mortalities among the lower animals on a farm as they may be a source of danger.

SHEATHER (A. Leslie). **The Cultivation of Anaerobes in Mass.**—*Jl. Comp. Path. & Therap.* 1928. Sept. Vol. 41. No. 3. pp. 259–260. With 1 text fig.

This method is a modification of the diffusion shell method described previously in the *Journal of Comparative Pathology and Therapeutics* by MCEWEN. The Whatman diffusion shells are replaced by a porous pot of the kind used in electric batteries.

The pots used are 10 cm. long and 4 cm. in diameter. Two-litre filter flasks with necks sufficiently large to allow the pot to be lowered into them are used. Wire is used to support the pot as this is not affected when the plug and flask neck are flamed.

The pot referred to holds sufficient liver tissue for a litre of broth.

The sugar to be added to the medium is made into a strong solution and placed in a small bottle which is suspended in the flask by thin wires.

After sterilizing in the autoclave the contents of the bottle are emptied into the broth by drawing up the wire which is attached near the bottom of the bottle. In this way a minimum of change is produced in the sugar during autoclaving.

If the cultures are to be used for the preparation of formalized vaccine it is important that the bottle which contained the sugar is not allowed to drop into the broth as the culture which will grow in it will not certainly be acted upon by the formalin.

MYCOTIC DISEASES.

BERNARD. La lymphangite épizootique à la Guadeloupe. [**Epizootic Lymphangitis in Guadeloupe.**]—*Rec. Méd. Vét. Exot.* 1928. Apr.–June. Vol. 1. pp. 81–83.

The author records the results of his observations on mules on a large sugar plantation from 1919.

The number of mules ranged from 329 to 546, and the figures show that the incidence of the disease has been extraordinarily variable. The highest percentage was 44 (in 1919–20) and the lowest 0·41 (in 1927–28). But there was not a steady decline throughout the period under review. There was a fall from 44 per cent. in 1919–20 to 8·8 in 1922–23, and this was followed by a steady rise to 23·2 per cent. in 1925–26. During the next period the percentage fell to only 1·68.

In all, 616 cases have occurred with 65 deaths. The deaths occurred either in very young or very old animals, or in animals which had been overworked.

The average period of treatment was 56 days.

In about a dozen cases relapses occurred in one to three months after apparent complete recovery. In no case was the relapse serious.

Treatment must be begun as early as possible. Recognizable lesions should be treated surgically, and cauterized.

Good results are said to have been obtained in generalized cases by the intravenous injection of novarsenobenzol-billon, sulpharsenol, and galyl.

DISEASES DUE TO FILTERABLE VIRUSES.

DAUBNEY (R.). **Observations on Rinderpest.**—*Jl. Comp. Path. & Therap.* 1928. Sept. Vol. 41. No. 3. pp. 228–248. With 4 graphs in text. To be continued.

Daubney finds that 0·001 cc. of whole blood is a reliable small infective dose for experimental purposes. The incubation period following this dose is quite regular, and very little longer than that following a dose of say 2·5 cc.

In a number of experiments it was shown that the virus is closely attached to the leucocytes, and attempts were made to detach the virus from them. It was thought that the virus might simply be

adsorbed to the leucocytes and that detachment might be achieved by alteration of physical conditions. As apparatus for subjecting blood to cataphoresis was not available resort was had to replacement of the plasma by lightly buffered solutions which were more acid and more alkaline than normal plasma.

In every case negative results were obtained, but it was found that the virus in the cells was destroyed by acid solutions of pH 4·5.

All attempts to cultivate the virus have failed, and it is specially noted that Gye and Barnard's method was included in the experiments. From these latter experiments the fact emerged that the rinderpest virus is killed readily by chloroform and that such killed virus has no antigenic powers.

In connexion with immunization against rinderpest the author draws attention to the disadvantages attaching to the serum-simultaneous method, namely the risk of forming a new centre of infection and the transmission of protozoan parasites.

Occasional success in conferring immunity by means of sub-infective doses of spleen pulp led the author to experiment with that material as a vaccine. The use of formolized virus in foot-and-mouth disease suggested a similar treatment of spleen pulp for the purpose of preparing a rinderpest vaccine.

A small number of experiments have been carried out using spleen, blood, liver, lymph glands, and kidney treated with varying strengths of formalin, and—for the most part—incubated at 37° C. for 72 hours. The indications appear to be that the weaker the formalin the better the result with spleen pulp. Lymph gland and kidney appear to be of lower value as formalized vaccine, while blood and liver are apparently valueless.

CARMICHAEL (J.). **Anti-Rinderpest Serum—Preliminary Field Research in Uganda.**—*Jl. Comp. Path. & Therap.* 1928. Sept. Vol. 41. No. 3. pp. 185–190.

In a previous paper RICHARDSON and Carmichael reported upon the control of an outbreak of rinderpest by means of locally produced serum. The earlier brews of serum were of remarkably high titre. 10 cc. of serum blocked out the reaction due to a simultaneous inoculation of 2 cc. of virulent blood. The animals used weighed 400–500 lb.

The potency of this serum gradually declined until a dose of 100 cc. was required per 100 lb. weight. At this level it remained constant.

The original serum producers were animals which had recovered naturally, which were hyperimmunized with 3,000 cc. of virulent blood.

It appeared to be reasonable to suppose that if naturally recovered animals could after hyperimmunization yield so powerful a serum, then the serum of such animals could be used before hyperimmunzation in doses of practicable size for the control of outbreaks in the field.

If this could be established then in an outbreak of the disease, or in an area where the disease is enzootic, the serum of recovered animals could be used on the spot, eliminating hyperimmunization, transport and serum-producing plant.

The opportunity to test this view came about a year later, when an outbreak occurred on the eastern border of the Protectorate.

The opportunity was taken to determine the relative value of serum from various types of animals, and the practicability of serum production in the absence of laboratory facilities.

Serum was tested from three groups of animals. (1) Those which had recovered from a natural attack. Those obtained for the purpose had recovered eleven, seven, and four weeks previously. (2) Animals subjected to the serum simultaneous inoculation with thermal and clinical reactions. (3) Animals, immunized 6 weeks previously, which had shown no reaction to the inoculation.

In all 108 animals were used for the experiment with 4 controls.

A tabular statement shows the number of animals used in each section of the experiment, the dose of serum given (both rate per 100 lb. and actual dose), and the mortality in each section.

Six animals were treated with 2 cc. of virus and 50 to 100 cc. of serum from a doubly inoculated animal which had shown no evidence whatever of reaction. Five of these died.

Six were treated with serum from a doubly inoculated animal which gave a normal reaction. Of these one died. Thirty-seven were given serum from an animal which had recovered from a natural attack eleven weeks previously. Of these 6 died.

Twenty-four had serum from an animal recovered 7 weeks previously. Of these six died. Twenty-one were given serum from an animal which had recovered from a natural attack four weeks previously. All of these survived.

Ten were treated with virus and a mixture of serum from recently recovered animals. One died.

The general reactions to the inoculations are summarized as follows:

Serum from " blocked out " reactors—very severe, despite large doses.

Serum from artificially immunized animals—marked.

Serum from naturally recovered animals—the severity of the reaction was inversely as the dose used.

In 13 out of 31 animals which received 50 cc. of serum from naturally recovered animals " blocked out " reactions resulted. The results in general indicate that the protective value of the serum is in direct relationship to the severity of the original reaction of the serum producer. Hyperimmunization would appear to increase the titre in the same proportion. It is confirmed that the " blocked out " reaction confers immunity.

MALFOY (F.). Les liquides organiques dans la peste bovine. [**The Organic Liquids in Cattle Plague.**]—*Rec. Méd. Vét. Exot.* 1928. Apr.–June. Vol. 1. 76–81.

The author sketched out an extensive programme of investigation regarding possible changes in the various body fluids in animals infected with cattle plague, but his numerous duties did not permit him to carry it through.

KLING (C.) & HÖJER (A.). Recherches sur la mode de propagation de la fièvre aphteuse. [**The Method of Spread of Foot-and-Mouth Disease.**]—*C. R. Acad. Sci.* 1928. May. Vol. 186. No. 21. pp. 1450–1452.

Kling and Höjer as a result of their studies of the outbreaks of foot-and-mouth disease in Sweden from 1875 onwards have come to the conclusion that man is the principal vehicle of importation and spread of the virus.

Attempts to infect human beings by intradermal inoculation and monkeys by intradermal and intraperitoneal inoculation failed. But

when croton oil was first instilled into the nostrils the animal developed rhinitis and diarrhoea within 24 hours of the painting of the nose, pharynx, and mouth with virus.

Samples of the nasal discharge and faeces were collected, emulsified with glycerin and stored in the ice chest for several days. Lesions were produced with these materials in guineapigs, the nature of which was definitely established by further inoculations and by immunity tests. Positive results were obtained with the faeces 49 days after infection. It is noted that the virus appeared to be attenuated by this time as the period of incubation was prolonged.

TRAUTWEIN (K.) & REPPIN (K.). Versuche zur Desinfektion bei Maul-und-Klauenseuche mit schwefliger Säure sowie mit Natronlauge. [**The Disinfection of the Virus of Foot-and-Mouth Disease Virus with Sulphur Acids and Soda Lye.**]—*Arch. f. Wiss. u. Prakt. Tierheilk.* 1928. June. Vol. 58. No. 1. pp. 95–112.

The authors confirm the results obtained by American investigators that soda lye is an excellent disinfectant for the virus. One per cent. solution is as good as, and sometimes superior to, 5 per cent. sulfoliquid solution.

Soda lye has many advantages. It is effective, cheap, odourless, harmless, and can be combined with lime wash.

HELM (R.) & WEDEMANN (W.). Versuche mit verschiedenen Desinfektionsmitteln zur Abtötung des Virus der Maul- und Klauenseuche und der Bakterien der Geflügel Cholera. [**The Effects of Certain Disinfectants upon the Virus of Foot-and-Mouth Disease and the Fowl Cholera Bacillus.**]—*Arch. f. Wiss. u. Prakt. Tierheilk.* 1928. June. Vol. 58. No. 1. pp. 68–94.

Cresol-sulphuric acid, formaldehyde, soda lye, and Sulfalyd 1 and 2 are good disinfectants for the virus of foot-and-mouth disease.

Against the fowl cholera bacillus soda lye was at the head of the list.

SCHOENING (H. W.). **Experimental and Field Results of the Single Injection Canine Rabies Vaccine.**—*Cornell Vet.* 1928. Apr. Vol. 18. No. 2. pp. 105–115.

According to the Statistics of the Ministry of Agriculture and Forestry, 755,072 dogs were vaccinated with the single vaccine in Japan in the period 1918 to 1925. Of these 170 developed rabies.

In the Department of Tokyo from 1919 to 1926, 205,310 dogs were vaccinated, and of these 48 developed rabies within a fortnight and 112 within a year. 4,275 cases of rabies were reported among unvaccinated dogs during the same period. No figures are given for the number of non-inoculated dogs.

The groups cannot be compared until something is known regarding the exposure to infection in the two groups. As inoculated dogs are usually pets the exposure to risk would be far less among these than among the non-inoculated group, which would consist largely of stray animals.

It appears from the figures on the prevalence of rabies in non-inoculated dogs, and the number of persons exposed, that the vaccinating that has been done has not been successful in reducing rabies and its menace to human beings.

The figures for Tokyo for the period 1921 to 1925 show that of 118,151 dogs vaccinated 105 died of rabies, and of 21,968 registered but non-vaccinated dogs 529 died of the disease.

EICHHORN and LYON using Umeno's vaccine found that a high degree of resistance was conferred and that this lasted about a year.

In 1925 the author reported on a vaccine prepared according to the method of Umeno and Doi.

The general results of these experiments showed that the efficacy of the single vaccine depended upon the type of street virus to which the animals were exposed and further that the carbolic-and-attenuated virus was not certainly free from danger in that paralysis and death might result from its use. It is, of course, very objectionable that a vaccine should be capable of infecting dogs.

The author now records the results of experiments with a killed vaccine. In the first test eight dogs were given 5 cc. of killed vaccine. About 6 weeks later they and four controls were inoculated intra-ocularly with a suspension of street virus. Six test dogs and two controls died of rabies.

In a second experiment nine vaccinated dogs and eight controls were exposed to the bites of three rabid dogs. Two controls died of rabies. The whole of the remainder remained healthy. One dog, vaccinated with killed virus and one control were inoculated intramuscularly with emulsion of salivary gland from a natural case of the disease. The vaccinated dog survived. Four dogs were inoculated intramuscularly with brain emulsion of street virus. At the same time one was given 5 cc. and another 10 cc. of killed vaccine. The only dog to die was that which had had 5 cc. of vaccine.

The fact is that data are not sufficiently numerous or exact to be of value as yet in determining the value of the vaccines per se. In so many instances other anti-rabic measures complicate the interpretation.

STEYN (D. G.). **Preliminary Report on a South African Virus Disease amongst Pigs.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. and Res.* Part I. 1928. Oct. pp. 415–428.

This disease was first reported by QUIN from the Koedoesrand Ward in August 1926. It was said that in places it was impossible to raise pigs, and that the disease was more prevalent among pigs running free than among those in styes. It was also noted that large numbers of warthogs were affected in the same area. It was held that the domestic pigs contracted the disease from this animal.

The symptoms as described were: All ages affected. Listlessness, heavy breathing, grinding of teeth and foaming at the mouth. Death often occurs in 24 hours. Sometimes animals remain sick for a few days and show a swaying gait. Recovery apparently occurs in a few instances and leaves an increased degree of resistance, but not an absolute immunity. The disease is most prevalent in the spring. On post-mortem the farmers found the intestinal mucosa dark red and ulcerated in some cases. A pig was sent for examination at the laboratory and the following lesions were found: Fluid in the pericardium, haemorrhages in the heart muscle, fibrinous pleurisy, croupous pneumonia, haemorrhagic infiltration of the lymphatic gland, and of the kidneys, and croupous typhlitis. The disease was transmitted to pigs by blood inoculation, and it also spread naturally to pigs in the adjacent stye. Experiments showed that the blood of pigs showing

fever, and the blood and bile of pigs dead of the disease were infective by inoculation. Simple contact and the ingestion of faeces and urine from diseased pigs caused infection. The infection could also be carried by attendants. The virus was found to be capable of passing a Seitz filter, and further experiments appeared to indicate that the virus was to a great extent attached to the red corpuscles. Pigs of all ages could be infected and the virus was quite non-pathogenic for horses, cattle, sheep, goats, dogs, cats, rabbits, guineapigs, pigeons and white mice. The average incubation period after inoculation was 2 days (36 hours to 4 days). Death occurred in 2 or 3 days after the onset of symptoms as a rule, but exceptionally the animals lived a week or more. The temperature curve is rather characteristic. There is a sudden rise to even 108° F., a maintenance of 105°–107° F. for a couple of days and then a sudden drop, often to subnormal.

The symptoms are dullness, gradually culminating in coma. Mucopurulent discharge from the nose. The lungs are involved in 50 per cent. of cases. Frequently there is diarrhoea, which may be haemorrhagic, but in some cases there is constipation. Paresis occurs in the later stages.

The lesions found in the experimental cases were those found in natural cases. Microscopic examination revealed fatty degeneration of the heart muscle, and of the liver. The latter organ showed cellular infiltration and 50 per cent. of the cells were eosinophiles. In the kidneys the tubules showed necrotic foci and fatty degeneration.

A small number of experiments regarding immunity appeared to indicate that the tendency to develop resistance was small. The disease appears to correspond very closely with that described by MONTGOMERY in East Africa in the *Journal of Comparative Pathology and Therapeutics*, 1921.

MISCELLANEOUS.

TEPPAZ (L.). Un cas de Lymphangite ulcéreuse traité par le biiodure de mercure en injections intraveneuses. [**A Case of Ulcerative Lymphangitis treated by Intravenous Injections of Biniodide of Mercury.**]—*Rec. Méd. Vét. d'Alfort.* 1928. July. Vol. 104. No. 7. pp. 406–407.

After six weeks of ordinary treatment had failed to cause any improvement in a serious case of ulcerative lymphangitis treatment was begun with a solution of biniodide of mercury 0·2 per cent. and potassium iodide 0·4 per cent. in water.

Thirteen injections were given at intervals of two days. The dose was 20 cc. and it was injected into the jugulars alternately. An apparently complete recovery resulted.

MÉLANIDI (C.) & STYLIANOPOULO (M.). La pleuro-pneumonie contagieuse des chèvres en Grèce. [**Contagious Pleuro-Pneumonia of Goats in Greece.**]—*Rev. Gén. Méd. Vét.* 1928. Sept. 15. Vol. 37. No. 441. pp. 490–493.

The authors believe, as a result of their experience in Greece, that the so-called Anatolian pneumonia of goats and contagious pleuro-pneumonia of goats are one and the same disease.

The disease first made its appearance in Greece in 1920, when it occurred in Piraeus. Since then it has become widespread.

It appears to have been imported from Asia Minor.

A number of organisms have been described by different authors as being the cause of the disease, but it appears to be a fact that so far no one has succeeded in transmitting the disease in series experimentally.

The authors' experiments lead them to hold that the cocco-bacillus described by a number of investigators as the cause of the disease is in reality not responsible for the condition.

They do not put forward any views of their own regarding its causation.

STECK (Werner). **Pathological Studies on Heartwater.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part I. 1928. Oct. pp. 283–305. With 3 graphs, and 5 figs. on 2 plates.

The lesions recognizable at post-mortem examination are as follows:—

The visible mucous membranes have a bluish pink colour. There is usually a considerable amount of serous fluid in the peritoneal cavity in cattle. In sheep this is not encountered so frequently. Petechiae may be present on the serous membranes.

Similarly there may be large quantities of fluid in the thoracic cavity with serous infiltration of the connective tissues.

The pericardium may contain either a large amount of serous fluid or, in some cases, a soft clot.

The lymph glands of the body may be enlarged and moist and frequently show congested capillary arborizations.

In about 50 per cent. of cases there is congestion of the larynx and trachea.

The lungs show pronounced oedema.

The epicardium shows haemorrhages of various sizes up to a few centimetres in diameter and it is frequently covered with a layer of fibrin.

Haemorrhages in the endocardium are usually more marked in the left ventricle.

The changes occurring in the liver vary considerably in their extent, but generally speaking they are those associated with congestion and fatty infiltration.

The spleen in the smaller species may be six times as large as normal, but in bovines it is rarely more than twice the normal size.

The kidneys do not show any marked changes as a rule, but the surface may appear mottled.

The abomasum generally shows hyperaemia with haemorrhage in the mucous membrane, and the small intestine may show similar lesions. The changes, which are of a similar nature, are less pronounced in the large intestine.

On microscopic examination the most pronounced abnormalities are found in the kidneys, liver and lungs.

In sections of liver there is marked evidence of blood stasis. In the capillaries there is an excess of nucleated cells. Among these macrophages form the majority and lymphocytes the minority.

The liver cells may show fatty infiltration with small droplets. There is a periportal infiltration.

Sections of the lungs show the picture of the tissues and spaces saturated and filled with serous exudate. The connective tissues, as a result, stand out prominently. Cellular infiltration is not marked.

In about 50 per cent. of cases the kidneys are the seat of a distinct and fairly characteristic lesion. The convoluted tubes may show cells with degenerated nuclei among normal-looking cells. These may contain hyaline droplets of considerable size. Hyaline casts may be present in the lumen of the tubes. There is never any formation of necrotic foci. The blood vessels are congested and the number of nucleated cells in them may be markedly increased. The majority of these are macrophages.

Rickettsia are found in large numbers in some cases in the endothelium of the small blood-vessels.

Interstitial changes have the character of an inflammatory reaction, but there is no formation of connective tissue.

"A correlation between these interstitial changes and the presence of Rickettsias goes only so far that in general Rickettsias are present in a number to be easily detected when the interstitial changes are well pronounced. But there may be many Rickettsias accompanied by slight interstitial changes and also the opposite, few Rickettsias with marked interstitial changes. As far as the localization is concerned, there is no correlation at all."

Various parts of the central nervous system show more or less pronounced leucostasis. Rickettsias are numerous in the vascular endothelium, but there was no local reaction.

The author has seen "an intracellular Rickettsia in the wall of a capillary vessel passing within some 10μ from the epidermis."

DU TOIT (P. J.). **Investigations into the Cause of Vomeersiekte [Vomiting Sickness] in Sheep.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part 1. 1928. Oct. pp. 109–153. With 3 figs. on 1 plate.

Although it has been suspected for many years that the development of this disease was connected with the ingestion of Geigeria, conclusive evidence has been conspicuously absent. A single successful experiment was made out of a large number attempted between 1908 and 1923, to mention only the most recent.

It has been definitely established that vomeersiekte is caused by the ingestion of *Geigeria passerinoides*, Hart., and that other factors, such as eating salt, and the presence of wire worms, which were thought by the farmers to be of importance, have no part in the causation.

The minimal amount of the plant necessary to produce the symptoms is 5 lb. consumed over three days, but some sheep only showed symptoms after consuming 80 lb. over 42 days.

The symptoms may continue after the cessation of eating the plant, and sheep may show the symptoms vomiting and stiffness, either simultaneously or one before the other. Either may appear first.

An attack does not confer any immunity, nor do there seem to be sheep possessing any natural immunity, but the degree of susceptibility appears to vary within wide limits.

Rapid drying or wilting of the plant does not destroy the toxin, but it does appear to deteriorate in dried plants after some months.

Supplementary rations such as maize do not prevent the development of symptoms.

THEILER (Arnold). **Ecthyma Contagiosium of Sheep and Goats.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part I. 1928. Oct. pp. 9–14. With 4 figs. on 1 plate.

This condition is characterized by an eruption of the skin on the upper and lower lips, which has a warty appearance. In some cases lesions occur on the mucous membrane. If the crusts are detached in the early stages a bleeding surface is left, but if they are left until they fall spontaneously no scar is found. The complete course of the disease occupies about 14 days. Cases have been found in which the skin of the udder has become infected from the mouth by licking.

In South Africa the disease is usually uncomplicated.

The disease is readily transmitted by scarification, and the abdomen and the inner sides of the thighs are suitable sites for the production of lesions experimentally.

The development of the experimental lesion is as follows. In 24 to 48 hours a red circle appears. Then a papule forms in the centre. This becomes a glistening pustule. Later the pustule becomes turbid and it is then replaced by a brownish crust. This in time falls off, leaving no scar.

The disease occurs naturally in the sheep and goat, and particularly in the young of these species. It can be transmitted to either with ease. Attempts to infect bovines have not yielded clear-cut results. No attempts have been made to infect laboratory animals.

It has not been shown that the virus is filterable. Dry crusts and scabs kept in 50 per cent. glycerin retain their infectivity for months.

The condition appears to be quite distinct from sheep-pox.

NICOLAU (S.). Les modifications histo-pathologiques des capsules surrénales et des glandes salivaires des lapins morts d'encephalomyélite enzootique expérimentale (maladie de Borna). [**The Histo-Pathological Changes in the Supra-Renal Bodies and the Salivary Glands in Rabbits Dead of Experimental Enzootic Encephalomyelitis. Borna Disease.**]—*C. R. Acad. Sci.* 1928. Mar. 5. Vol. 186. No. 10. pp. 655–657.

Ganglia and nerve fibrils in the immediate neighbourhood of the supra-renals and even in the substance of the fibrous capsule show interstitial neuritis and mononuclear infiltrations. Neuronophagia and degeneration of the nerve cells have not been encountered, but in certain neurons intranuclear oxyphilic corpuscles with or without a halo have been found. These are the Joest-Degen inclusions and are undoubted evidence of the presence of the virus.

In the gland parenchyma near the line of junction of the medullary and cortical portions ganglion cells occur, and in animals dead of Borna disease they are frequently readily detected on account of cellular infiltration (lymphocytes, macrophages, and plasmocytes.)

In the neurons of such cells the intra-nuclear corpuscles of Joest-Degen are to be found.

The author is inclined to believe that certain symptoms of the experimental disease are due to functional deficiency of the supra-renals.

It is known that the salivary glands of animals dead of the disease contain the virus, and the author finds the typical lesions—as described above—in the parotid gland.

TIBIRIÇA' (P. de Q. T.). Arteriosclerose Bovine. [**Bovine Arteriosclerosis.**]—*Ann. da Facul. de Med. de São Paulo.* 1927. Vol. 2. pp. 311–372. With 20 figures. English summary p. 371.

The author describes the pathological conditions encountered in 50 aortas obtained from oxen of various types and ages.

The lesions occurred in various parts of the vessels and they are classified as plaques, depressions, wrinklings, nodules, dilatations, etc.

Microscopic examination revealed steatosis, calcification, rupture of the elastic coat, hyperplasia, etc.

The more important lesions were as follows: Longitudinal ridges running from the point of origin of the renal arteries to the external iliac arteries. Histological examination showed that there was muscular hyperplasia and splitting of the internal elastic layer with an increase of elastic fibres in the interna.

Dilatation of the aorta was found to be due to rupture of the circular elastic fibres.

Calcareous lesions were found in the muscular and elastic coats. These were surrounded by thin fibrous capsules.

CONKLIN (R. R.). **Intravenous Injection of Colloidal Carbon in Human and Veterinary Medicine.**—*Cornell Vet.* 1928. Apr. Vol. 18. No. 2. pp. 205–214.

The material used was chemically pure animal carbon suspended in distilled water. The bones from which it was prepared were cleaned free of soft tissues before charring. The earthy salts were removed by concentrated hydrochloric acid and the acid thoroughly washed away. The particles were then thoroughly ground up in a sterile mortar and test suspensions made to ascertain the size of the particles. Usually it was attempted to get particles about 1 micron in diameter. The suspension is autoclaved. (Fuller details are not given.)

By experiment it was found that 0·001 gramme per kilog. gave the best results, and the suspension was such that a horse of average size was given 50 cc.

The treatment is given intravenously by gravitation. Introduction of the suspension into the connective tissue leads to nodule formation.

It is claimed that great benefit has been derived from the treatment in cases of joint ill in foals, metritis, lymphangitis accompanied by ulceration, calk wounds, mastitis, septicaemia resulting from the use of a septic milking tube, and abscess formation.

Over a hundred cases have been treated in domesticated animals with complete success and without a single fatality.

It is stated that there is no "negative phase," that following the injection there is a rise of temperature with acceleration of respiration and perspiration. These symptoms pass off within an hour.

No explanation is offered as to the manner in which the treatment acts, but suggested explanations are mentioned.

Details of four or five cases are given.

SHAW, Jr. (Edwin H.). **The Absorption of Chemical Compounds by Red Blood Corpuscles and its Therapeutic Significance in the Treatment of Bird Malaria.**—*Amer. Jl. Hyg.* 1928. July. Vol. 8. No. 4. pp. 583–603.

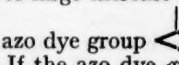
The plan of this work was to study the effect of variation in the structure of compounds on their capacity for being absorbed by red

blood corpuscles, and also to determine the physico-chemical nature of the absorption. The evidence regarding the latter point indicates that it is a case of the distribution of a solute between two immiscible phases.

The author enumerates the various techniques which, but for certain objections to each, might have been applied to the study, and finally shows that the most suitable technique is that employing the interferometer. By empirical calibration with known concentrations of various substances, unknown concentrations can be obtained by direct interpolation.

The exact details of the technique do not lend themselves to abstraction, and the bulk of the paper is made up of tabular statements of tests carried out with various quinine compounds.

The author summarizes the effect of change in structure as follows:—

1. Stereoisomerism about the asymetric carbon atom does not produce any great change in the partition coefficient.
2. Variation or removal of the methoxy group does not produce any great change in the partition coefficient except that its absence appears to reduce the coefficient slightly.
3. The effect of hydrogenation of the vinyl group is as above.
4. Similarly conversion of $-OH$ group to $>C=O$ group with rupture of the bond between C and N as in the isomerisation of quinine to quinatoxine has little effect.
5. Conversion of the nitrogen atom to a quaternary salt. $R\equiv N\begin{matrix}/R\\ \backslash X\end{matrix}$ results in the complete loss of power to penetrate the corpuscle.
6. The same result follows the oxidation of the vinyl group to the carbonyl group.
7. If the compound as formed under 6 is esterified to form an ester group ability to penetrate appears again, but to a less extent than if the vinyl group is left unchanged.
8. A large increase in the partition coefficient follows the addition of an azo dye group  .
9. If the azo dye group added contains an ionic group capable of yielding ions at pH 7·4, the dye, instead of having a high coefficient of partition is quite unable to penetrate the red corpuscle.

The experiments carried out with derivatives of cinchona were repeated with various other compounds for the purpose of verification. Among these it was also found that only those which do not possess ionic groups are absorbed by normal red corpuscles.

In general lipoid soluble substances are absorbed by the red blood corpuscle, probably because the bounding membrane is permeable to them. Ionic compounds of high molecular weight are not capable of permeating the membrane and are not absorbed.

HAYDEN (C. E.) & FISH (Pierre A.). **The Normal Blood of Some Domesticated Animals.**—*Cornell Vet.* 1928. Apr. Vol. 18. No. 2. pp. 197–203.

The authors publish data which have been collected over a period of years, but the pressure of other duties has not permitted continuous observations.

There is some evidence to indicate that seasonal conditions cause variations. In some instances tests have been made on batches of animals at monthly intervals over long periods, and the average has been taken as the standard.

Determinations have been made for sugar, urea, uric acid, total non-protein nitrogen, creatinin, chlorides, calcium, inorganic phosphates, acid soluble phosphates, refractive index and serum protein of the blood of the cow, goat, and chicken, as well as the haemoglobin, erythrocyte and leucocyte counts including differential counts of the last-named.

Although only the cow, goat and chicken are mentioned in the text, the tables give figures for the horse and dog also.

TABLE I.

Animal	Cow	Horse	Dog	Chicken	Male Goats	
	Mg. per 100 cc. of blood				Normal	Castrated
Sugar	46·52	102·9	82	139·1	59·11	56·69
Urea	12·21	18·7	11·7	5·38	14·99	14·97
Uric Acid—						
Direct Method ...	2·04	2·45	—	—	Little	Little
Indirect method...	0·623	0·69	0·45	2·47	Little	Little
Total non-protein nitrogen	29·79	33·9	30·8	28·82	32·22	32·57
Creatinin	1·20	1·81	1·5	1·10	1·17	1·12
Chlorides	444·1	—	468·	487·6	484·99	491·76
Calcium	10·88	—	—	9·9	10·32	10·9
Inorganic phosphates	5·70	—	—	3·96	7·43	8·55
Acid soluble phosphates	9·29	—	—	—	12·44	14·1
Refractive index ...	1·3488	—	—	1.3430 1·3443	1·3470	1·3473
Serum protein ...	7·358 per cent.	—	—	4·259 per cent. 4·934 per cent.	6·389 per cent.	6·55 per cent.

TABLE II.

	Cow	Horse	Dog	Chicken	Male Goats	
					Normal	Castrated
Hemoglobin per cent.	89·24	94	90	74	82·72	83·4
Erythrocytes per cmm.	6,547,538	7,944,000	5,967,000	2,825,777	15,389,789	15,820,378
Leucocytes ... per cmm.	9,034	5,625	8,221	38,888	8,978	11,995
Lymphocytes per cent.	55·33	30·	19·4	81·35	63·62	63·53
Mononeuclears per cent.	0·865	6·	6·3	1·54	2·42	1·93
Polymorphs per cent.	27·298	59·	68·	10·285	30·55	29·56
Eosinophiles per cent.	15·19	4·	6·1	5·173	2·85	4·26
Basophiles ... per cent.	0·38	1·	Rare	1·623	0·36	0·47

BALFOUR (A.). **A Condition resembling Goundou in a Pony.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Nov. Vol. 22. No. 3. p. 295.

The article describes what appears to be a case of goundou occurring in a European who has never been out of England, and Balfour publishes this note as a kind of appendix.

A condition resembling goundou has been described in certain apes and monkeys.

A photograph of the pony—a small circus pony—shows bilateral thickening of the nasal process of the superior maxillary bone. The pony was about the size of a retriever and quite tame and Balfour saw it on board ship on the way from Mauritius to Bombay. The swellings were hard to the touch. The site, appearance, and consistence of the swellings suggest that it was a case of goundou.

GOLDBERGER (J.), WHEELER (G. A.), LILLIE (R. D.) & ROGERS (L. M.). **A Study of the Blacktongue-Preventive Action of 16 Foodstuffs, with Special Reference to the Identity of Blacktongue of Dogs and Pellagra of Man.**—*Pub. Health Rep.* Wash. 1928. June 8. Vol. 43. No. 23. pp. 1385–1454.

The principal object of the study has been to obtain evidence regarding the relation between blacktongue preventive and pellagra preventive, and thus of blacktongue to pellagra. An attempt has been made to correlate the blacktongue-preventive potency of each foodstuff to its pellagra-preventive potency where this was known.

In the case of maize, wheat-germ, cowpea, milk, butter, cod-liver oil, lean beef, and tomato the pellagra-preventive potency is strikingly similar to the potency against blacktongue.

In the case of Soya bean, carrot, and rutabaga evidence of the preventive-potency against pellagra is not strong enough to permit comparison, but probably the properties are similar.

There is therefore a considerable degree of agreement as to the presence of both pellagra-preventive and blacktongue preventive substances in certain foodstuffs. This would appear to be evidence of some weight that the two conditions are identical.

If this conclusion is correct it follows that the results of tests of preventive action carried out in the dog are applicable to the disease in man.

Maize is of little if any value. Whole wheat contains the blacktongue preventive but in small amount. Commercial wheat germ is superior to this.

Cowpea and Soya bean are useful—the former is superior to the latter. Milk contains the principle but not in large amounts. Butter and cod-liver oil are of little value.

Beef muscle is a good source of the preventive principle in both pellagra and blacktongue.

Pork liver, canned salmon, and egg yolk are all valuable sources of blacktongue preventive. They are being tested in pellagra.

Canned tomatoes, carrots and rutabaga are of small value.

LEGG (J.). **Strychnine Poisoning in Sheep.**—*Australian Vet. Jl.* 1928. June. Vol. 4. No. 2. pp. 63–64.

Strychnine poisoning in sheep is so uncommon an occurrence that the author places this instance on record.

Deaths began to occur among a flock of ten thousand Camburg ewes in April 1928, near Cloncurry, in Queensland.

During the first 48 hours it was estimated that 200 animals had died. By the fourth day the mortality was decreasing. As nothing could be found by the stock inspector to account for the deaths the author undertook an investigation about a week after the trouble had begun. At this time no deaths were occurring and no sick sheep could be detected.

Post-mortem examination was out of the question as the most recent carcase was already 24 hours' old and very putrid, but some rumen contents were obtained for analysis.

The manager had been in the habit of laying pieces of meat heavily charged with strychnine as bait for dingoes, but this had been done for some years. Analysis showed that strychnine was present in the material analysed.

It was subsequently ascertained that the manager, suspecting that the baits might have something to do with the trouble, had put out a quantity of salt a few days after the trouble started. He thought it possible that the sheep, craving for salt, had licked the baits. It is probable that many of the baits contained salt as it is the practice in Northern Queensland to salt beef the day of killing, and the baits were all made from scraps from the station butcher's shop.

METTAM (R. W. M.). **Recent Contributions to our Knowledge of Poisonous Plants as affecting Domestic Animals.**—*Kenya & East African Med. Jl.* 1928. June. Vol. 5. No. 3. pp. 68–76.

Plant poisoning occurs under certain conditions, the principal of which are: (1) the introduction of animals to a pasture with which they are unfamiliar, (2) scarcity of grazing, (3) accidental consumption of poisonous plants in hay.

In connexion with plant poisoning it must be remembered that toxic symptoms may possibly be due to some parasite or fungus on the plant.

It is important to note that many excellent fodder grasses may become exceedingly poisonous under certain conditions. Sorghum and andropogon produce hydrocyanic acid on wilting.

The so-called colour index of Henrici may prove of value when searching for grasses which may have become poisonous. HENRICI found that grasses which have a reddish purple stem during drought possess very little cyanogenetic substances, while those which have normal coloured stems produce a high percentage of hydrocyanic acid.

It is important to add that wilted grasses swollen by rain lose their cyanogenetic substances in a few hours.

Tribulus terrestris, the cause of geeld dikkop in South Africa, occurs in Kenya, but up to the present there is no record of its being toxic. It is remarkable that feeding tests carried out in Australia with this plant have always failed—a possible explanation of which is that the experiments have not been carried out there with the plant at the exact stage at which THEILER found it poisonous, namely, while it is growing vigorously before the formation of seeds.

A further point to be borne in mind is that plants vary in toxicity according to the soil upon which they are grown.

Many types of plant poisoning occur in districts where certain diseases are endemic. CURSON has recorded the occurrence of Acokan-

thera poisoning in districts where heartwater occurs—the symptoms of these conditions are very much alike. Mettam is able to confirm CURSON's observation and in one outbreak 25 deaths among cattle were traced to *Acokanthera schimperi*.

Many investigators believe that there may be some connexion between the flora of a country and certain diseases—diseases other than those requiring an insect vector—and particularly those due to filterable viruses. Horse-sickness is a case in point. This occurs in certain districts the flora of which is fairly typical of low-lying hot country. So far the reservoir of the virus has not been detected, and, further, the virus can survive for several years in a district where there are no horses and infects an animal introduced. It appears to be feasible that the virus is not absolutely dependent on animal life, but may exist as a parasite possibly—on some vegetable structure. This point requires investigation because it is known that plants suffer from diseases due to filterable viruses, and little has been done to see whether these have any pathogenic properties for animals.

Reference is made to the peculiarities of chronic vegetable poisoning such as production of parenchymatous hepatitis in horses by *Senecio latifolius*, the most important point in connexion with which is the period elapsing between the cessation of feeding and the onset of clinical symptoms.

The writer records an instance in which a number of animals wandered off their usual grazing ground to the dried-up bed of a stream and 47 died between one afternoon and the next morning. No post-mortem examinations were made and on searching a plant—one of the Umbelliferae—was found in the river bed which did not occur in the pasture. Experiments were begun at the farm and at Kabete, with remarkable results, for all the experimental animals died within 12–18 hours. Roots and stems were particularly poisonous. Two ounces were toxic for sheep and goats, and 8–12 ounces for cattle.

The plant has not yet been identified because at the time no flower or fruit could be obtained, but flowering specimens have been sent to Pretoria for identification.

STEYN (D. G.). **Tulp Poisoning.**—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part I. 1928. Oct. pp. 197–202.

The name Tulp (tulip) is given to a large number of plants of the *Homeria* and *Moraea* genera, and up to the present three of these (of about 50) have been proved to be toxic.

Cattle, donkeys, goats and sheep are most frequently poisoned. Horses seldom or never eat the plant.

The severity and rapidity of onset of the symptoms depends upon the amount eaten and whether water has been taken as well. There may be only transitory diarrhoea or there may be death within an hour.

Generally speaking the symptoms indicate abdominal pain accompanied by tympany.

In agreement with this the most constant lesion found is acute gastro-enteritis, associated with capillary haemorrhages in various tissues and organs.

The only reference to the dose proving poisonous is that ½ lb. of *Homeria pallida* may cause death of a sheep in an hour.

STEYN (D. G.) **Gifblaar Poisoning. A Summary of our Present Knowledge in Respect of Poisoning by** *Dichapetalum cymosum.*—*Union of S. Africa. 13th & 14th Reports, Director Vet. Educ. & Res.* Part I. 1928. Oct. pp. 187–194.

Under natural conditions only cattle, donkeys, sheep and goats are susceptible, but experimentally it has been shown that all domestic species are actually as susceptible. Under natural conditions they do not eat the plant.

It is important to note that gifblaar leaves and buds are odourless and tasteless; hence animals may eat them unwittingly.

The plant is most poisonous at two periods, August to November and March to May when young leaves form. The nature of the toxic principle has not been decided. It is not a glucoside, and there is no evidence that it is an alkaloid. It is readily soluble in water but not in absolute alcohol.

The symptoms may appear within 12 hours of the ingestion of the plant in the case of cattle.

Animals lie down with the head turned back, and if forced to rise stagger and lift the feet very high. The forefeet are spread out in front and the hind tucked under the body. Urination is frequent. The pulse is feeble and rapid, respiration shallow and quick. There is pronounced hyperaesthesia with exaggeration of the reflexes, and quivering of the muscles. Vision is impaired and there is marked salivation.

In sheep and goats the train of symptoms is similar.

In dogs, experimentally fed, symptoms may appear in four hours. Vomition is the most constant. Retching may persist for several days. Dysentery may appear twelve hours after the ingestion. Cyanosis occurs at an early stage.

At the post-mortem examination the following lesions may be found:—

In cattle, sheep and goats.—Ascites, hydrothorax, sub-endothelial haemorrhages, oedema of the lungs, slight enlargement of the spleen, degeneration of the liver, acute catarrhal enteritis.

In horses.—Similar.

In dogs.—In very acute cases only hyperaemia of the stomach and cyanosis, and in cases lasting a few days catarrhal and sometimes haemorrhagic enteritis.

Treatment is purely symptomatic.

THEILER (A.). **Phosphorus Deficiency in Stock.**—*Queensland Agric. Jl.* 1928. Aug. 1. Vol. 30. No. 2. pp. 138–140.

This is a report of a lecture given by Sir Arnold Theiler in Queensland, and is a brief summary of the ascertained facts.